

# DAILY LIFE IN A MISSION

**NEED  
TO  
KNOW**

## Teacher Information: Toys: Clay Marbles

**Background:** *For centuries people have made pottery from soil containing clay. No other earth material has such importance and wide use, as does clay. It is characterized as being plastic when wet, and hard and rigid when dried and fired. These characteristics allow for it to be used as a building material. Clay soils have a nature that provides for water retention.*

*Clay materials have a variety of uses in engineering. One such use is found in the earthen dams that have been made impermeable to water by adding suitable clay materials to porous soils.*

*Pottery, one of the oldest and most widespread of the decorative arts, consists of objects made of clay and hardened with heat. Commonly, objects are useful ones, such as vessels for holding liquids, and plates or bowls for serving food. Earthenware is the oldest and simplest form of pottery, fired at a low heat. Stoneware is a pottery compound that is fired at a sufficiently high temperature to cause it to blend and become extremely hard.*

*Some of the earliest human settlements used clay in pottery and the remains of the pottery provide a record of that civilization. As a building material, bricks (fired and as adobe) have been used in construction since early times. Impure clay was used to make bricks, tile and the cruder types of pottery, while kaolin, a china clay, is required for the finer grades of ceramic materials.*

*Clay is easily molded into almost limitless shapes. Sun-dried pottery does not harden, as does oven-fired clay. A sun-dried clay vessel will soften if filled with water. Firing at high temperatures in an oven, known as a kiln, renders the clay vessel virtually immune to deterioration, but brittle.*

*Mission Indian women used clay to make pottery. They watched the children as they worked. Possibly the children rolled and fired small pieces of clay as they played along side their mother.*

### TEKS (Texas education standards)

- *Demonstrate safe practices during field and laboratory investigations*
- *Collect information by observing and measuring*
- *Construct simple graphs, tables, maps and charts to organize, examine and evaluate information*
- *Estimate and measure mass using standard units*
- *Measure to solve problems involving length*
- *Use addition and subtraction to solve problems with whole numbers*
- *Describe ways people have adapted to and modified their environment in Texas, past and present*
- *Identify reasons why people have adapted to and modified their environment in Texas, past and present, such as the use of natural resources to meet basic needs*

- *Analyze the consequences of human modification of the environment in Texas, past and present*

### **Materials**

- *Introductory Story from A Day in the Life of the Missions*
- *Clay (pottery-type, not modeling clay) -- 50 grams/group*
- *Soap and towels to clean hands*
- *Newsprint paper (mat for a working area)*
- *Grill and fuel (charcoal briquettes), or a kiln*
- *Ruler, metric-cm*
- *Charts I, II, & III (a set for each student)*
- *Math or science Balance, precision to one gram*
- *Kid's Guide to Mission Espada. (copy for each student)*

### **Teaching Hints and Safety Precautions**

1. *Have students work in groups of three or four to produce marbles.*
2. *Impure clay is available at local commercial sandpits, and pottery clay is available from suppliers of art supplies.*
3. *Many art teachers will have a kiln where marbles can be fired.*
4. *Have the students wear aprons and short-sleeved clothing. Clay can stain.*
5. *Caution students to avoid contamination of eyes or mouth with clay from soiled hands.*
6. *Bake the marbles when students are not present to avoid burns or injury from an occasional exploding marble.*
7. *Remind students that park ethics do not allow the grounds of the mission to be altered in any way by the visitors, so clay cannot be gathered in the national park.*

### **References**

*Bunzel, Ruth Leah. The Pueblo Potter, A Study of Creative Imagination in Primitive Art. New York: Dover Publications. 1972.*

*Huxford, Sharon. The Collector's Encyclopedia of Roseville Pottery. Paducah, Ky.: Collector Books. 1976.*

*Harbin, Edith. Blue and White Stoneware, Pottery & Crockery. Paducah Ky.: Collector Books. 1977.*

*Schwartzman, Paulette. A Collector's Guide to European and American Art Pottery. Paducah Ky.: Collector Books. 1978.*

*Peabody Museum of Archaeology and Ethnology. Historic Hopi Ceramics: The Thomas V. Keam Collection of the Peabody Museum of Archaeology and Ethnology. Cambridge, Mass: Harvard University Press. 1981.*

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## Student Information: Toys: Clay Marbles

**Objective:** You will make marbles using a technique similar to one used by Mission Indian children.

### Engagement

1. Discuss activities that you or other children engage in while your parents are working near-by.  
Do you or other children do anything to help your parents?  
Do you or other children do anything that mimics your parents' activity? (*Mimic* means to do something similar or a "pretend" activity.)
2. Listen as the teacher reads a story that describes some of the tasks Mission Indians did during their stay in the missions. (Introductory Story from *A Day in the Life of the Missions*)
3. Work with a small group of students to make a list of the activities in which children might have engaged while their parents were working at a mission. Save this list for later use when you visit the mission.





## Exploration

In this investigation, you will participate in an activity similar to one that might have occupied mission Indian children.

### Part I

1. Get 50 grams of clay from your teacher.
2. Pinch off a portion of clay and roll it in both hands to make a marble-sized ball. Lightly mark it #1. Use your ruler to measure its diameter in centimeters to the nearest tenth of a centimeter.
3. Predict the marble's mass and place your prediction in Chart I. Remembering that you started with 50 grams of clay, would you like to change your prediction?
4. Use your math or science balance to determine the actual mass of the marble and record this in Chart I.
5. Pinch off another portion of clay that you think is the same mass as your first one. Predict its mass and place your prediction on the chart.
6. Determine its actual mass with your balance. Add or remove clay until the mass is within  $\frac{2}{10}$  of a gram of your first one. Record its mass on Chart I. Roll it into a ball like the first one and mark it #2.
7. Repeat steps 5 and 6 until you have 10 marbles. (Ask for more clay if you do not have enough to complete your marble set. Return any unused clay to your teacher.)
8. Allow your marbles to air-dry for several days. (How long they take to dry depends on the relative humidity and temperature.)

### Part II

1. Your teacher will supply a grill or kiln. Place your marbles carefully into the grill or kiln. Make a sketch to show where you put your marbles so you can locate them after they have baked. (The teacher may have to place the marbles if the baking device cannot be brought to the classroom.) Your teacher will remove the marbles when the briquettes have either burned out or the kiln has been turned off. Allow the marbles to air-cool naturally to avoid cracking or splitting.
2. Record the number of those marbles that broke in Chart II.
3. Predict the mass of marble #1. Record this in your chart.
4. Repeat step 3 until you have predicted and recorded the mass of each marble.
5. Determine and record the actual mass for each of the marbles.

## Explanation

Complete Chart III and then answer the following questions:

1. Did your marbles increase, decrease or maintain their original mass?
2. How can you explain this?
3. Why were the marbles air-dried before they were baked?  
(Remember: Water becomes steam when it is heated to 100° Celsius.)
4. Was this an activity in which children helped their parents, or one in which they mimicked their parents?

## Elaboration

Visit Mission Espada. Your teacher will provide you with *A Kid's Guide to Mission Espada*. As you do the activities, think of games and other toys that mission children might have played with.



## Evaluation

Sitting quietly (in the shade if it is a hot day), imagine you lived at Mission Espada in 1780. Illustrate one part of the mission and put yourself in it. What are you doing? Is it chores or studies? Are you playing or going to church? Review *A Kid's Guide to Mission Espada* for additional ideas. Share your project with the class.



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## Evaluation criteria:

40%

You accurately illustrated the mission setting and portrayed an activity that probably occurred there.

60%

You constructed your marbles neatly, and completed all calculations and measurements accurately.

You completed all questions with answers based on the stories of the missions and observations made while constructing your marbles.

Name: \_\_\_\_\_

**Chart I: Data BEFORE Marbles Are Fired**

Marble	1	2	3	4	5	6	7	8	9	10
Diameter-cm										
Predicted mass-g										
Actual Mass-g										

**Chart II: Data AFTER Marbles Are Fired**

Marble	1	2	3	4	5	6	7	8	9	10
Broken - Yes or No										
Predicted mass-g										
Actual Mass-g										

Name: \_\_\_\_\_

**Chart III: Comparison of Marbles Before and After Firing**

<b>Marble</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Mass (g) Of Marbles Before Baking</b>										
<b>Mass (g) Of Marbles After Baking</b>										
<b>Difference In Mass (g)</b>										